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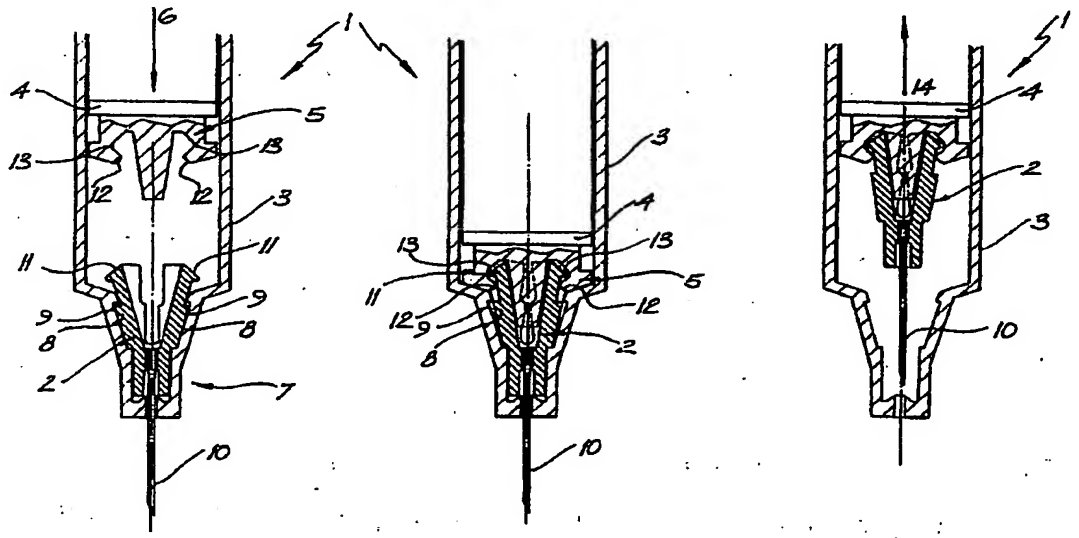

(57) Abstract

A hypodermic needle syringe device (1), comprising a needle holding hub (2) having a hypodermic needle (10) attached to one end thereof, a syringe housing (3), ne end thereof detachably holding said needle holding hub (2), and a plunger (4) movable within said housing (3), having a release and lock mechanism (5) on one end thereof. In use, during completi n of an injecti n stroke of said device (1) when said end of said plunger (4) abuts said end f said h using (3), said mechanism (5) releases said needle hub (2) from said h using (3) and locks said needle hub (2) t said nd of said plunger (4). During a withdrawal stroke after said injection stroke, said needle hub (2) and said needle (10) attached thereto are retracted by said plunger (4) to within said housing (3).

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SYRINGE DEVICE

The present invention relates to a hypodermic needle syringe device, and in particular to such device which facilitates retraction of the hypodermic needle thereof after completion of use.

In recent times, particularly since the advent of the AIDS epidemic, numerous attempts have been made to design hypodermic needle syringe devices which are non-reusable. Generally, such devices are rendered useless after an initial operation thereof by destruction of some part of the device, or removal of certain essential elements thereof such that further operation of the device is obviated.

Whilst many alternative implementations of retractable syringes are currently known, many of these are complex in design, and consequently cumbersome to operate. As a result, much unnecessary wastage of such devices results due to incorrect operation thereof. Also, such devices are often so complex that they become extremely expensive to manufacture, the costs of such syringe devices not being justified particularly for a single use thereof.

The present invention seeks to provide a hypodermic needle syringe device which is simple is construction, and also simple to operate.

In one broad form, the present invention provides a hypodermic needle syringe device, comprising:

a needle holding hub having a hypodermic needle attached to one end thereof;

a syringe housing, one end thereof detachably holding said needle holding hub; and,

a plunger movable within said housing, having a release and lock mechanism on one end thereof;

whereby, in use, during completion of an injection stroke of said device when said end of said plunger abuts said end of said housing, said mechanism releases said needle hub from said housing and locks said needle hub to said nd of said plunger, and, during a withdrawal stroke after said injection stroke, said needle hub and said needle

attached thereto are retracted by said plunger within said housing.

Preferably, the d vice is implemented wherein said needle hub is provided with first engaging means thereon to cooperate with first engaging means on said housing, and, second engaging means to cooperate with said mechanism on said plunger.

Also, preferably, the device is implemented wherein said needle hub is of substantially V-shaped cross-section, is provided with said second engaging means at substantially the ends of the arms thereof, and, is provided with said first engaging means intermediate each of said second engaging means and the intersection of said arms where said hypodermic needle is attached.

In the most preferred form, said needle hub is substantially symmetrical about an axis extending from the longitudinal axis of said needle.

Also, in a preferred form, the device is designed such that said needle hub is substantially conically shaped, and wherein said end of said housing is shaped in the form of a taper to receive said needle hub and provide self sealing properties.

Preferably, the device is embodied wherein said first engaging means on said needle hub consist of shaped protrusions/indents and said first engaging means on said housing consist of corresponding shaped indents/protrusions and whereby at least one of said first engaging means is formed of resilient material and whereby each of said first engaging means are provided or biased such that they normally interengage to retain said needle hub within said housing.

Preferably, said second engaging means on said needle hub consist of shaped protrusions/indents and said mechanism on said plunger is provided with corresponding shaped indents/protrusions, and whereby at least one of said second engaging means or said mechanism is formed of resilient material such that when at the completion of said injection stroke when said end of said plunger abuts said end of said housing, said mechanism on said plunger causes disengagement

of each of said first engaging means to disengage said needle hub from said housing, and engag ment of said second ngagement m ans of said needle hub with said mechanism of said plunger, and such that during said withdrawal stroke, said needle hub and said needle attached thereto are retracted by said plunger to within said housing.

Also, preferably, said mechanism is provided with a tapered interface to receive said second engaging means of said needle hub to deform and guide said arms of said needle hub therein such that said second engaging means engage the respective correspondingly shaped indents/protrusions provided at a lower extremity of said tapered interface, the resilience of said arms causing non-releasable engagement of said arms of said needle hub from said mechanism of said plunger.

In a preferred embodiment, biasing means is provided to automatically cause said withdrawal stroke after said injection stroke.

The most preferred form of this embodiment is wherein said biasing means is embodied as a spring provided within said plunger and/or said housing.

In another preferred embodiment, the hypodermic needle syringe device is implemented wherein said hypodermic needle device is self cleansing, a sterilising fluid being provided within a cavity in the plunger and sealed with a membrane.

A specific but very preferred embodiment of the invention is wherein said needle hub is configured having two resilient arms extending transversely to the longitudinal axis of a substantially cylindrically shaped body portion to which said needle is attached, wherein each of said arms has an intermediate portion thereof provided with a first outwardly directed projection or male clip thereon forming said first engaging means and an outwardly tapered end with a second outwardly directed projection or male clip depending therefrom forming said second engaging means whereby, in use, said end of said plunger is shaped to cooperate with the tapered ends of each arm to bias each of said arms inwardly towards said longitudinal axis consequ ntly disengaging said first outwardly directed

projections from engagement with corr spondingly but opposit ly shaped recesses in said syringe housing and guiding said second outwardly dir cted projections into non-releasable engagement with corresponding by oppositely shaped recesses within said end of said plunger.

In such embodiment, the device is preferably implemented wherein the end face of said plunger is provided with a substantially concavely shaped recess axially therein with the outward portion thereof being tapered to receive and resiliently deform said second outwardly directed projections of said needle hub, said recess being provided with incisions adjacent to the inner extremities of said tapered portion, said incisions being shaped to receive said second outwardly directed projections and non-releasably attach said needle hub to said plunger.

Again, in such embodiment, the device is preferably provided wherein the inner surface of said end of said syringe housing is correspondingly shaped to releasably attach said needle hub, the extremity thereof being substantially cylindrically shaped to receive said cylindrically shaped body portion of said needle hub, and the intermediate portion thereof being substantially of truncated conical shape to receive said transverse arms therein, the intermediate portion being provided with recesses therealong to receive said first outwardly directed protrusions of said needle hub therein.

In this preferred embodiment again, the device is preferably provided wherein said cylindrical end of said syringe housing is provided with a convexly shaped end such that any alignment of said needle with the needle hub in the end of said syringe housing, after use of said hypodermic needle syringe device is substantially obviated.

Also, in a preferred form of the invention, a circular rib is provided on the inner cylindrical surface of said housing to provide a substantially airtight seal between said housing and said hub.

Also, a further preferred form of the invention is wherein a tap r is provided on the shoulder between said cylindrical portion and said conical portion of said end of

said housing and/or said cylindrical body portion and the arms of said needle hub to provide a substantially airtight seal between said housing and said hub.

Also, the device preferably has a rib provided about said plunger to provide an airtight seal between said plunger and said syringe housing.

Preferably, this syringe device is embodied wherein said needle hub and/or said plunger end are embodied such that, once said needle hub is engaged with said plunger said hypodermic needle is disaligned axially to substantially ameliorate the possibility of realignment of said needle with the needle hole in said syringe housing.

A more preferred form of the invention is wherein said cooperating mechanism is provided between said plunger and said housing such that only one filling stroke, one injection stroke and one withdrawal stroke is allowed.

The present invention will become more fully understood from the following detailed description of a preferred but non-limiting embodiment thereof in connection with the accompanying drawings wherein:

Fig. 1 illustrates three operational states of the hypodermic needle syringe device in accordance with the present invention, Fig. 1(a) illustrating the device prior to the injection stroke, Fig. 1(b) illustrating the device at the completion of the injection stroke, prior to the withdrawal stroke, and Fig. 1(c) illustrating the device during execution of the withdrawal stroke;

Fig. 2 details the needle hub portion of the device of the invention, Fig. 2(a) illustrating a cross-sectional view thereof, and Fig. 2(b) illustrating an end view thereof;

Fig. 3 illustrates details of the syringe housing, Fig. 3(a) illustrating a cross-sectional view of the syringe housing, Fig. 3(b) illustrating an end view of the syringe housing, and Fig. 3(c) showing an enlarged view of the end portion of the housing, that is, the end which has the needle attached thereto;

Fig. 4 illustrates the plunger portion of the inv ntion, Fig. 4(a) illustrating a cross-sectional view of the plunger, Fig. 4(b) illustrating an end view of th

plunger, and Fig. 4(c) illustrating an enlarged view of the injecting end of the plunger;

Fig. 5 illustrates a sealing means which may be optionally used to provide an airtight seal between the plunger and the syringe housing, Fig. 5(a) illustrating a cross-sectional view of the seal and Fig. 5(b) illustrating an end view of the seal;

Fig. 6 shows various optional sealing means which may be implemented to provide an airtight seal between the needle hub and the syringe housing; and,

Fig. 7 shows an alternatively preferred embodiment of a non-symmetrical needle hub.

Fig. 8 illustrates an alternative embodiment of a self-cleansing and self-retracting syringe.

The operation of the device is best illustrated in Fig. 1, which shows a syringe, generally designated by the numeral 1 comprising a needle holding hub 2, a syringe housing 3, and a plunger 4.

Fig. 1(a) illustrates the plunger 4, which includes a release and lock mechanism 5 on the end thereof, which will be detailed hereinafter with reference to Fig. 4, moving towards the end of the syringe housing, the direction of movement being indicated by the arrow 6. The end 7 of the syringe housing 3, is shown having a needle holding hub 2 retained therein, by engagement of the projections 8 thereof into recesses 9 in the syringe housing. The needle holding hub is shown having a hypodermic needle 10 attached thereto. Details of the needle holding hub will be described hereinafter with reference to Fig. 2.

Fig. 1(b) illustrates the hypodermic needle syringe device when the plunger 4 has reached the end of the injection stroke, the end of the plunger 4 consequently abutting the end of the syringe housing 3. As shown in Fig. 1(b), the release and lock mechanism 5 attached to the end of the plunger 4 has at this stage engaged the needle holding hub 2. In particular, the projections 11 at the end of the needle holding hub 2 have been biased towards each other by the inclin d surfaces 12 on the r lease and lock mechanism 5, and have com to rest within the indentations

13 behind the inclined surfaces of the release and lock mechanism 5. A consequence of this forced movement is that the projections 8 of the needle holding hub have also been biased towards each other and out of the recesses 9 of the syringe housing, releasing the needle holding hub 2 from the syringe housing 3.

Fig. 1(c) illustrates withdrawal of the plunger in the movement shown by arrow 14, the needle 10 being retracted to within the confines of the housing 3. During such movement, the needle holding hub 2 is locked into engagement with the release and lock mechanism 5 of the plunger 4.

Fig. 2 illustrates a detailed view of the needle holding hub 2, Fig. 2(a) illustrating a cross-sectional view thereof, and Fig. 2(b) illustrating an end view thereof. Fig. 2 clearly shows the construction of the needle holding hub 2 in accordance with the preferred embodiment of the invention. In this embodiment, the needle holding hub comprises a substantially cylindrical body section 15, with two arms 16 extending transversely therefrom at an angle inclined to the longitudinal axis of the cylindrical body portion 15. Preferably, the overall outside appearance of the arms is of truncated conical shape with splits in opposed sides thereof. As shown, each arm is provided with a projection 8 extending outwardly therefrom, which forms the first engaging means which allows attachment of the needle holding hub 2 to the syringe housing 3, and a further projection 11 towards the ends of the arms 16 which enables connection of the needle holding hub to the release and lock mechanism 5 attached to the end of the plunger 4. To direct the ends of the arms 16 into the incisions provided in the release and lock mechanism 5, the arms are preferably provided with inclined surfaces 17 thereon.

Fig. 3 illustrates details of the syringe housing, Fig. 3(a) illustrating a cross-sectional view thereof, Fig. 3(b) illustrating an end view thereof, and Fig. 3(c) detailing an enlarged view of the end 18 of the housing 3. As illustrated, the end 18 of the syringe housing is correspondingly shaped to receive the needle holding hub 2 therein, and provides inner surfaces, the extremity of which

is cylindrical in shape and shown by numeral 19, and the intermediate portion 20 of which is of truncated conical shape. The end 18 of the syringe housing 3 is also shown having recesses 21 which are adapted to engage the projections 8 of the needle holding hub 2. The end face 22 is also shown having a domed shaped portion in the centre thereof, for the specific purpose of misaligning the needle should an attempt be made to reinsert the needle through the needle receiving hole 23, after an initial use of the syringe device 1.

Fig. 4 illustrates the plunger portion of the invention, Fig. 4(a) illustrating a cross-section view thereof, Fig. 4(b) illustrating an end view thereof, and Fig. 4(c) detailing an enlarged view of the end portion 24 of the plunger 4. The end portion 24 is shown having a substantially concavely shaped recess 25 provided with indentations 26 spaced from the inclined entry surfaces 27 thereof. The purpose of the inclined entry surfaces 27 is to bias the arms 16 of the needle holding hub 2 towards each other (as shown in Fig. 1(b)), and particularly, such that the inclined surfaces 27 cooperate with the inclined surfaces 17 of the needle holding hub 2, directing the arms 16 towards each other and allowing the first engaging means 11 on the needle holding hub 2 to be pushed inwardly such that they come to rest in the indentations 26. A consequence of this inward pushing of the arms 16 is that the projections 8 on the needle holding hub are inwardly directed such that they are removed from the confines of the recesses 9 of the syringe housing 3. A central conically truncated shaped portion 28 is provided axially in the centre of the concavely shaped portion 25, to facilitate alignment and engagement of the needle holding hub 2 within the release and lock mechanism 5. It will however be appreciated that this central portion 28 is not an essential portion for operation of the invention. Also shown in Fig. 4 is a hinging tab 34 which may be optionally supplied on the plunger 4 to prevent accidental premature engagement of the plunger 4 with the needle holding hub 2. Obviously, at the intended time of us , the tab 34 is removed.

Fig. 5 illustrates a seal 29 which may be utilised in conjunction with the present invention. The seal is adapted to be provided about the plunger 4 such that an airtight seal is provided between the plunger 4 and the syringe housing 3. Various other forms of similar or known prior art seals may be provided about the various components of the device, as required.

Fig. 6 illustrates examples of where two sealing means may be provided on the inner surface of the syringe housing 3. The seal indicated by numeral 30 is shown as a circular rib provided on the inside of the cylindrical bore, providing a slight interference fit with the cylindrical body portion of the needle holding hub 15 to provide an airtight seal. The seal indicated by numeral 31 shows a short taper on top of the cylindrical section of the needle holding hub 2 which seals against a sharp corner on the inside of the corresponding position in the syringe housing 3. This also gives an airtight seal between the hub 2 and the syringe housing 3. Such form of seal, when the injection stroke takes place, causes the hub 2 to be pressed against this seal 31, with the result that the higher the pressure, the tighter the seal. The slight shoulder provides a stop to prevent over tightening of the hub 2 in the barrel 3. This feature facilitates easy withdrawal of the plunger 4 for retraction of the needle.

Fig. 7 illustrates an alternatively preferred embodiment of the hub described hereinbefore. In this case, the hub 2 is provided with two differently shaped arms 32 and 33 thereon, which are obviously adapted to engage correspondingly shaped portions of the plunger 4. This ensures that the needle is retracted to an off-centre position, consequently ensuring that the needle 10 cannot be accidentally inserted within the hole 23 of the syringe housing 3 for a second withdrawal and injection stroke. Other methods of embodying the device to ensure that the needle is displaced off-centre will become obvious to persons skilled in the art. For instance, the needle channel 23 could be constructed to be offset from the axis, to achieve the same result.

In Fig. 8 is illustrated an alternative embodiment of the hypodermic needle syring device which has a self-retracting means and a self-cleansing means incorporated therein. Fig. 8(a) illustrates the device 1 prior to activation of the injection stroke, wherein a sterilising solution is contained within a housing 35 having a repturable membrane 36 along one face thereof. At the completion of the injection stroke, as indicated in Fig. 8(b), the housing 35 is positioned adjacent the needle hub 2. At the completion of the injection, the membrane 36 is automatically ruptured by automatic retraction of the needle 10 by a spring 36 into the housing 35, as shown in Fig. 8(c). Therefore, the device illustrated in Fig. 8, which includes a spring 36 and a sterilising solution in a housing 35 enables the device to become self-retracting and self cleansing. It will be appreciated that other self-cleansing and self-retracting embodiments will become obvious to persons skilled in the art.

It will be appreciated that many alternative variations and modifications will become obvious to persons skilled in the art. For instance, a preferred format of the invention would be embodied wherein only one filling, one injection and one retraction stroke is enabled. This might, for example, be facilitated by a slight turning of the plunger relative to the housing at the end of each stroke, the plunger and housing being moved in only one direction in one way track. This could, for example, be embodied by utilisation of a sawtooth type track which allows withdrawal of the plunger for filling, a slight turning of the plunger relative to the housing, a single injection movement of the plunger, again a slight turning movement, and then a final withdrawal of the plunger. It will however be appreciated that other forms of single movement will become obvious to persons skilled in the art.

It will become apparent to persons skilled in the art that a resilient material is preferably utilised to construct the needle holding hub, or at least the arms thereof. It will however also be appreciated that whilst this may be one preferred implementation, this component

could be rigid in construction and th engaging plunger end and housing end could be provided of resilient material. It will also be appreciated that whilst the needle holding hub has been herein described as having projections which are adapted to engage correspondingly shaped recesses in the engaging components of the syringe, recesses could alternatively be provided on the needle holding hub which engage projections on the other device components. The size and shape of such engaging means are also obviously variable.

These variations and modifications, together with any other variations and modifications which become obvious to persons skilled in the art from a reading of the present specification, should however also be considered to fall within the spirit and scope of the invention as broadly described hereinbefore and as claimed hereinafter.

THE CLAIMS

1. A hypodermic needle syringe device, comprising:

a needle holding hub having a hypodermic needle attached to one end thereof;

a syringe housing, one end thereof detachably holding said needle holding hub; and,

a plunger movable within said housing, having a release and lock mechanism on one end thereof;

whereby, in use, during completion of an injection stroke of said device when said end of said plunger abuts said end of said housing, said mechanism releases said needle hub from said housing and locks said needle hub to said end of said plunger, and, during a withdrawal stroke after said injection stroke, said needle hub and said needle attached thereto are retracted by said plunger within said housing.

2. A hypodermic needle syringe device as claimed in claim 1, wherein said needle holding hub is provided with first engaging means thereon to cooperate with first engaging means on said housing, and, second engaging means to cooperate with said mechanism on said plunger.

3. A hypodermic needle syringe device as claimed in claims 1 or 2 wherein said needle hub is of substantially V-shaped cross-section, is provided with said second engaging means at substantially the ends of the arms thereof, and, is provided with said first engaging means intermediate each of said second engaging means and the intersection of said arms where said hypodermic needle is attached.

4. A hypodermic needle syringe device as claimed in claim 3 wherein said needle hub is substantially symmetrical about an axis extending from the longitudinal axis of said needle.

5. A hypodermic needle syringe device as claimed in claim 4, wherein said needle hub is substantially conically shaped, and wherein said end of said housing is shaped in the form of a taper to receive said needle hub and provide self sealing properties.

6. A hypodermic needle syringe device as claimed in any one of claims 2 to 5, wherein said first engaging means on said needle hub consist of shap d protrusions/indents and

said first engaging means on said housing consist of correspondingly shaped indents/protrusions and whereby at least one of said first engaging means is formed of resilient material and whereby each of said first engaging means are provided or biased such that they normally interengage to retain said needle hub within said housing.

7. A hypodermic needle syringe device as claimed in claim 6, wherein said second engaging means on said needle hub consist of shaped protrusions/indents and said mechanism on said plunger is provided with correspondingly shaped indents/protrusions, and whereby at least one of said second engaging means or said mechanism is formed of resilient material such that when at the completion of said injection stroke when said end of said plunger abuts said end of said housing, said mechanism on said plunger causes disengagement of each of said first engaging means to disengage said needle hub from said housing, and engagement of said second engagement means of said needle hub with said mechanism of said plunger, and such that during said withdrawal stroke, said needle hub and said needle attached thereto are retracted by said plunger to within said housing.

8. A hypodermic needle syringe device as claimed in claim 7, wherein said mechanism is provided with a tapered interface to receive said second engaging means of said needle hub to deform and guide said arms of said needle hub therein such that said second engaging means engage the respective correspondingly shaped indents/protrusions provided at a lower extremity of said tapered interface, the resilience of said arms causing non-releasable engagement of said arms of said needle hub from said mechanism of said plunger.

9. A hypodermic needle syringe device as claimed in any one of claims 1 to 8, wherein biasing means is provided to automatically cause said withdrawal stroke after said injection stroke.

10. A hypodermic needle syringe device as claimed in claim 9 wherein said biasing means is embodied as a spring provided within said plunger and/or said housing.

11. A hypodermic needle syringe device as claimed in any

one of claims 1 to 10, wher in said hypodermic needle device is self cleansing, a sterilising fluid being provided within a cavity in the plunger and sealed with a membrane.

12. A hypodermic needle syringe device as claimed in any one of claims 1 to 11, wherein said needle hub is configured having two resilient arms extending transversely to the longitudinal axis of a substantially cylindrically shaped body portion to which said needle is attached, wherein each of said arms has an intermediate portion thereof provided with a first outwardly directed projection or male clip thereon forming said first engaging means and an outwardly tapered end with a second outwardly directed projection or male clip depending therefrom forming said second engaging means whereby, in use, said end of said plunger is shaped to cooperate with the tapered ends of each arm to bias each of said arms inwardly towards said longitudinal axis consequently disengaging said first outwardly directed projections from engagement with correspondingly but oppositely shaped recesses in said syringe housing and guiding said second outwardly directed projections into non-releasable engagement with corresponding by oppositely shaped recesses within said end of said plunger.

13. A hypodermic needle syringe device as claimed in claim 12 wherein the end face of said plunger is provided with a substantially concavely shaped recess axially therein with the outward portion thereof being tapered to receive and resiliently deform said second outwardly directed projections of said needle hub, said recess being provided with incisions adjacent to the inner extremities of said tapered portion, said incisions being shaped to receive said second outwardly directed projections and non-releasably attach said needle hub to said plunger.

14. A hypodermic needle syringe device as claimed in claims 12 or 13, wherein the inner surface of said end of said syringe housing is correspondingly shaped to releasably attach said needle hub, the extremity thereof being substantially cylindrically shaped to receive said cylindrically shaped body portion of said needle hub, and the intermediate portion thereof being substantially of

truncated conical shape to receive said transverse arms therein, the intermediate portion being provided with recesses therealong to receive said first outwardly directed protrusions of said needle hub therein.

15. A hypodermic needle syringe device as claimed in claim 14, wherein said cylindrical end of said syringe housing is provided with a convexly shaped end such that any alignment of said needle with the needle hub in the end of said syringe housing, after use of said hypodermic needle syringe device is substantially obviated.

16. A hypodermic needle syringe device as claimed in any one of claims 13 to 15, wherein a circular rib is provided on the inner cylindrical surface of said housing to provide a substantially airtight seal between said housing and said hub.

17. A hypodermic needle syringe device as claimed in any one of claims 13 to 16, wherein a taper is provided on the shoulder between said cylindrical portion and said conical portion of said end of said housing and/or said cylindrical body portion and the arms of said needle hub to provide a substantially airtight seal between said housing and said hub.

18. A hypodermic needle syringe device as claims in any one of claims 1 to 17 wherein as rib is provided about said plunger to provide an airtight seal between said plunger and said syringe housing.

19. A hypodermic needle syringe device as claimed in any one of claims 1 to 18 wherein said needle hub and/or said plunger end are embodied such that, once said needle hub is engaged with said plunger said hypodermic needle is disaligned axially to substantially ameliorate the possibility of realignment of said needle with the needle hole in said syringe housing.

20. A hypodermic needle syringe device as claimed in any one of claims 1 to 19, wherein said cooperating mechanism is provided between said plunger and said housing such that only one filling stroke, one injection stroke and one withdrawal stroke is allowed.

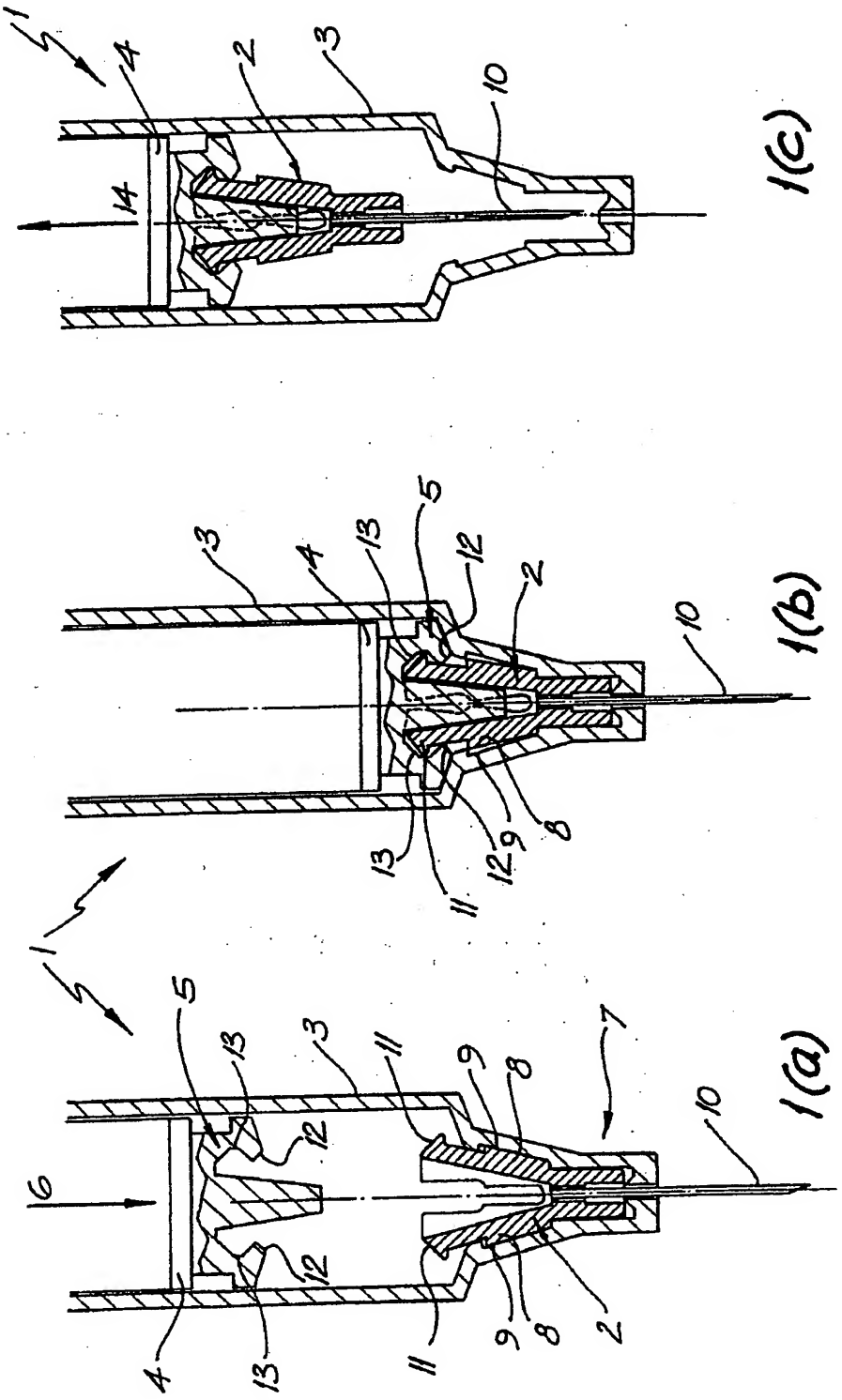
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FIG. 1

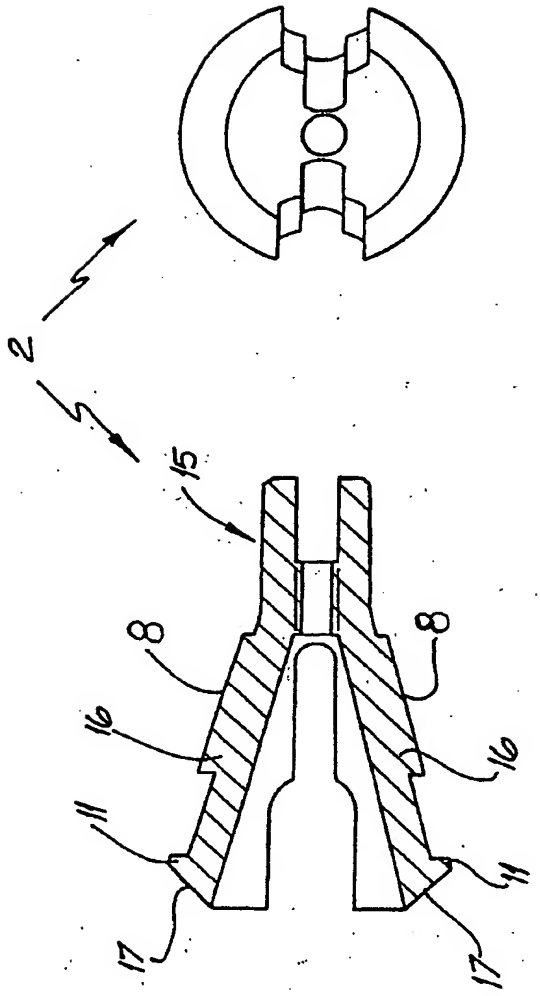
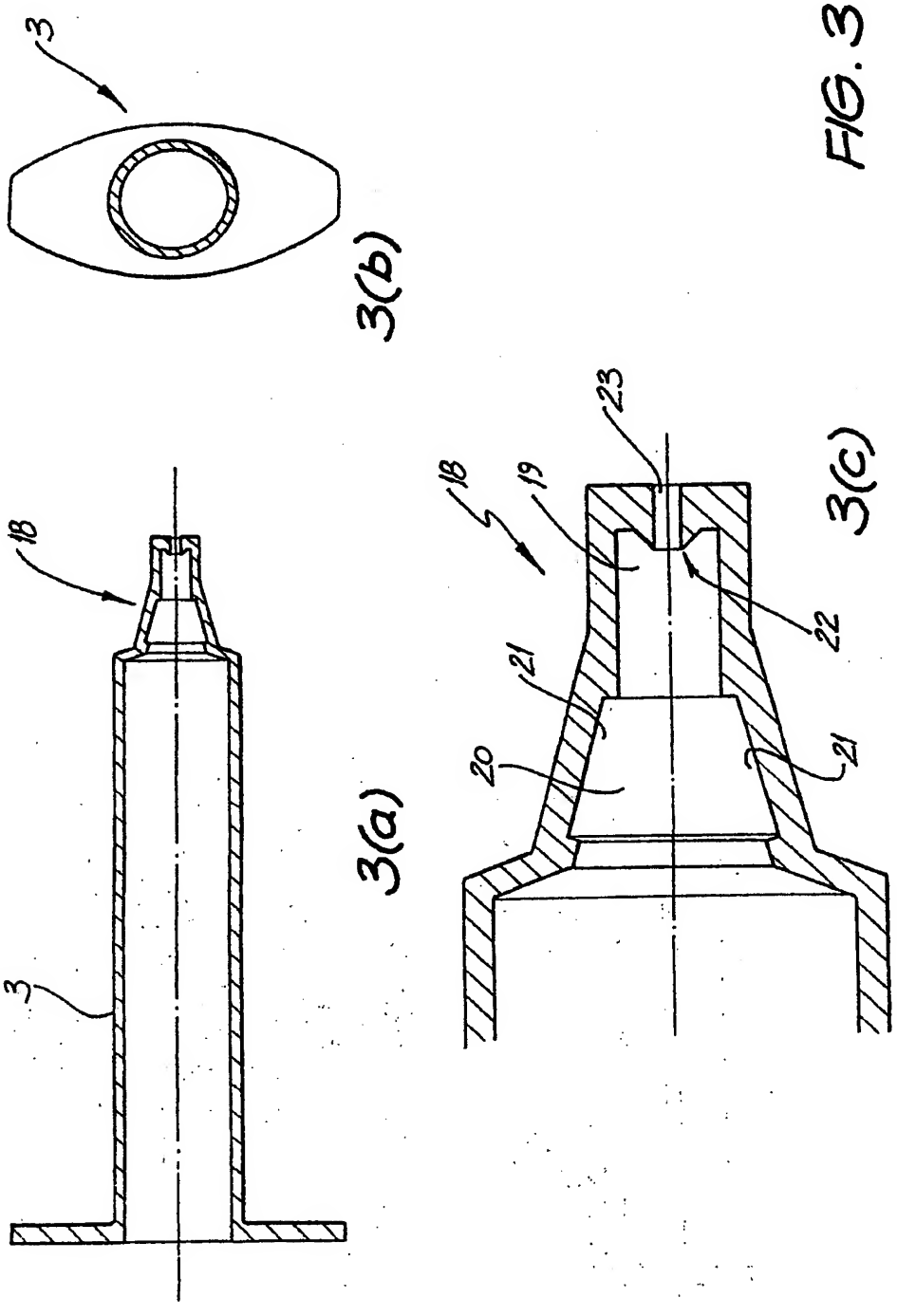
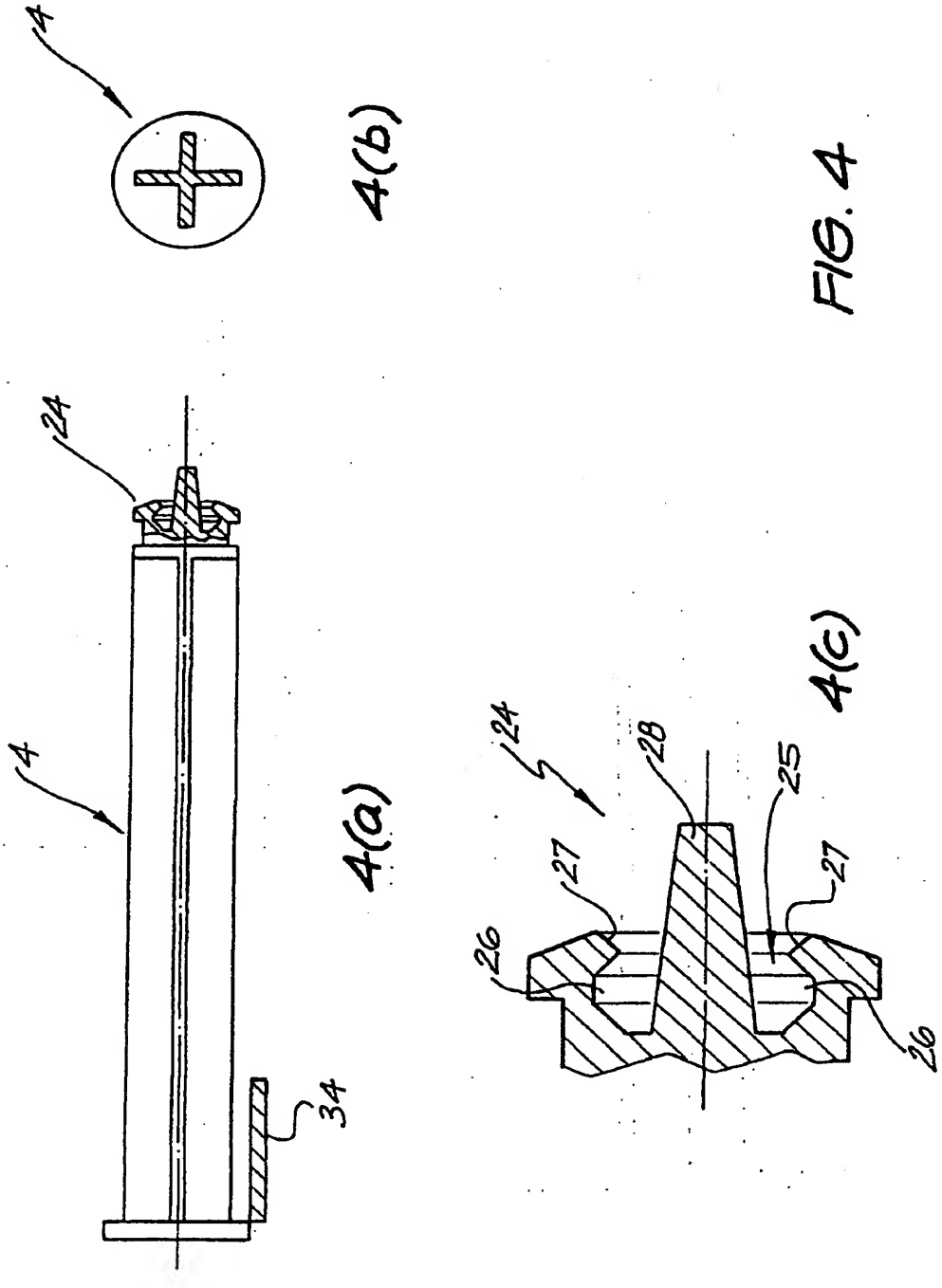


FIG. 2

FIG. 3

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4(b)
FIG. 4
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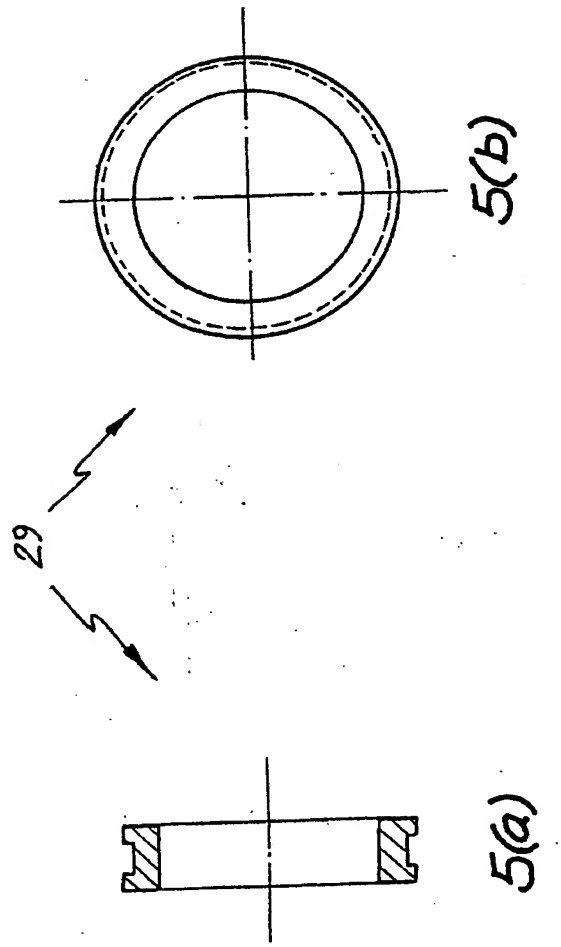

FIG. 5

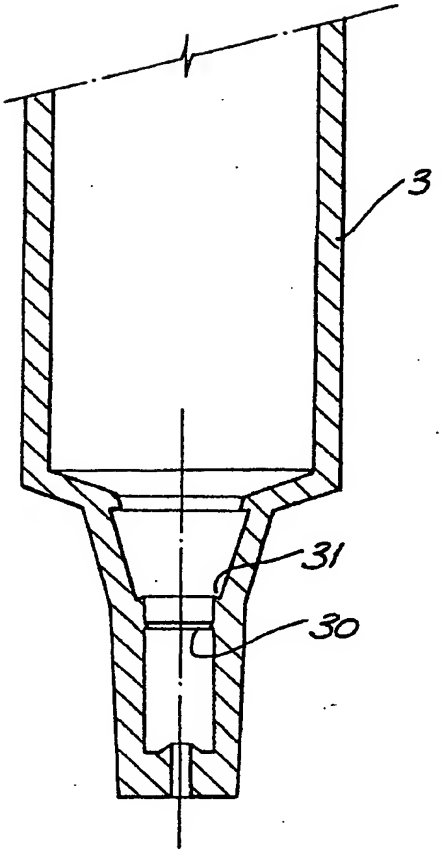

FIG. 6

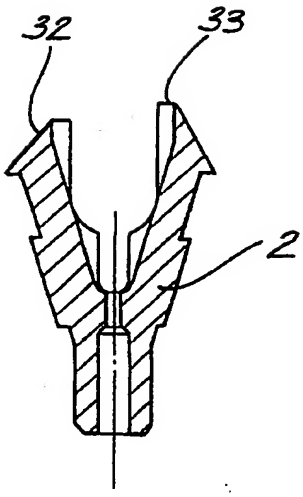

FIG. 7

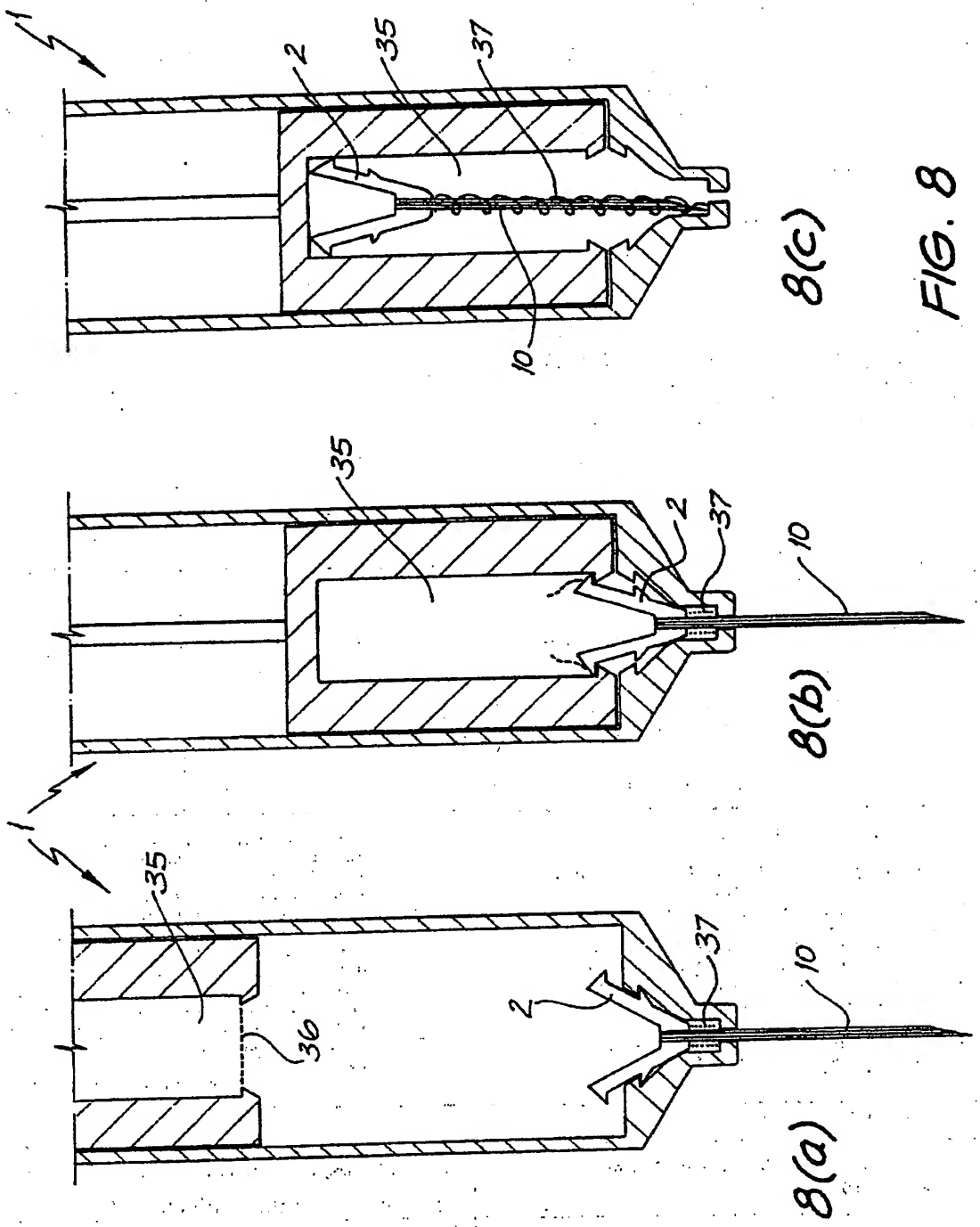

FIG. 8

INTERNATIONAL SEARCH REPORT

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent classification (IPC) or to both National Classification and IPC
Int. Cl.[5] A61M 5/315, 5/32, 5/50

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC	A61M 5/315, 5/32, 5/50

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

AU : IPC as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category*	Citation of Document, [11] with indication, where appropriate of the relevant passages [12]	Relevant to Claim No [13]
P,X	WO,A,91/04065 (ASSUMPSIT) 4 April 1991 (04.04.91). See Claims.	(1-9,18-20)
P,X	WO,A,91/07198 (CURIE) 30 May 1991 (30.05.91). See pages 3-6.	(1-8,12-20)
X	EP,A,347742 (VENTURINI) 27 December 1989 (27.12.89). See entire document.	(1-10,12-14, 16-18,20)
X	AU,A,28795/89 (BLAKE et al) 3 August 1989 (03.08.89). See drawings.	(1-5,18-20)
X	US,A,4950251 (HAINING) 21 August 1990 (21.08.90) See column 2 lines 28-68 and column 3 lines 1-15	(1-6,18,20)

(continued)

* Special categories of cited documents : [10]

"A" Document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior t the international filing date but later than the priority date claimed
"T" Later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
30 March 1992 (30.03.92)	3 April 1992 (03.04.92)
International Searching Authority	Signature of Authorized Officer
AUSTRALIAN PATENT OFFICE	A. ALI

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

X	US,A,4950241 (RANDFORD) 21 August 1990 (21.08.90). See entire document.	(1,2,6-7, 18,20)
X	US,A,4747830 (GLOYER et al) 31 May 1988 (31.05.88). See drawings.	(1,2,6,18, 20)
X	WO,A,89/04681 (CATCH 522 PTY. LTD) 1 June 1989 (01.06.89). See entire document.	(1,2,6,18, 20)

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE [1]

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim numbers ..., because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim numbers ..., because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claim numbers ..., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4a

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING [2]

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

☐ The additional search fees were accompanied by applicant's protest.

☐ No protest accompanied the payment of additional search fees.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL APPLICATION NO. PCT/AU 91/00599

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-m ntioned international search report. Th Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Member		
WO 9104065	AU 64236/90	CA 2045394	
WO 9107198	AU 66363/90		
EP 347742	IT 8867588		
AU 89 28795	US 4986813 NZ 227755	EP 327061	JP 2005971
US 4950251	EP 388137		
US 4950241			
US 4747830	JP 2001288		
WO 8904681	AU26288/88		

END OF ANNEX